387f Global Solution of Nonlinear Optimal Control Problems

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Nonlinear optimal control problems have been the main interest of researchers in this field for many years. The necessary condition of optimality in nonlinear optimal control usually gives rise to Two Point Boundary Value Problems (TPBVP). Many studies on the numerical solution for TVBVP's have been conducted over the decades. Nevertheless, none of these techniques is guaranteed to capture all solutions to the TPBVP.

In our work, we studied some integral-based iteration method as a tool to solve TPBVP. Approximate numerical methods are then investigated. In our proposed method, we use higher order Runge-Kutta method to get the approximate numerical solution of the ODE for a given initial point. The initial states of interested TPBV problem are chosen belonging to some intervals, then, the intervals of final states are calculated by using some interval analysis techniques, which in turn is easy to judge if the required final states are in these calculated intervals. The branch-and-bound algorithm is utilized to revise the initial intervals until the intervals shrink and converge to the solution.